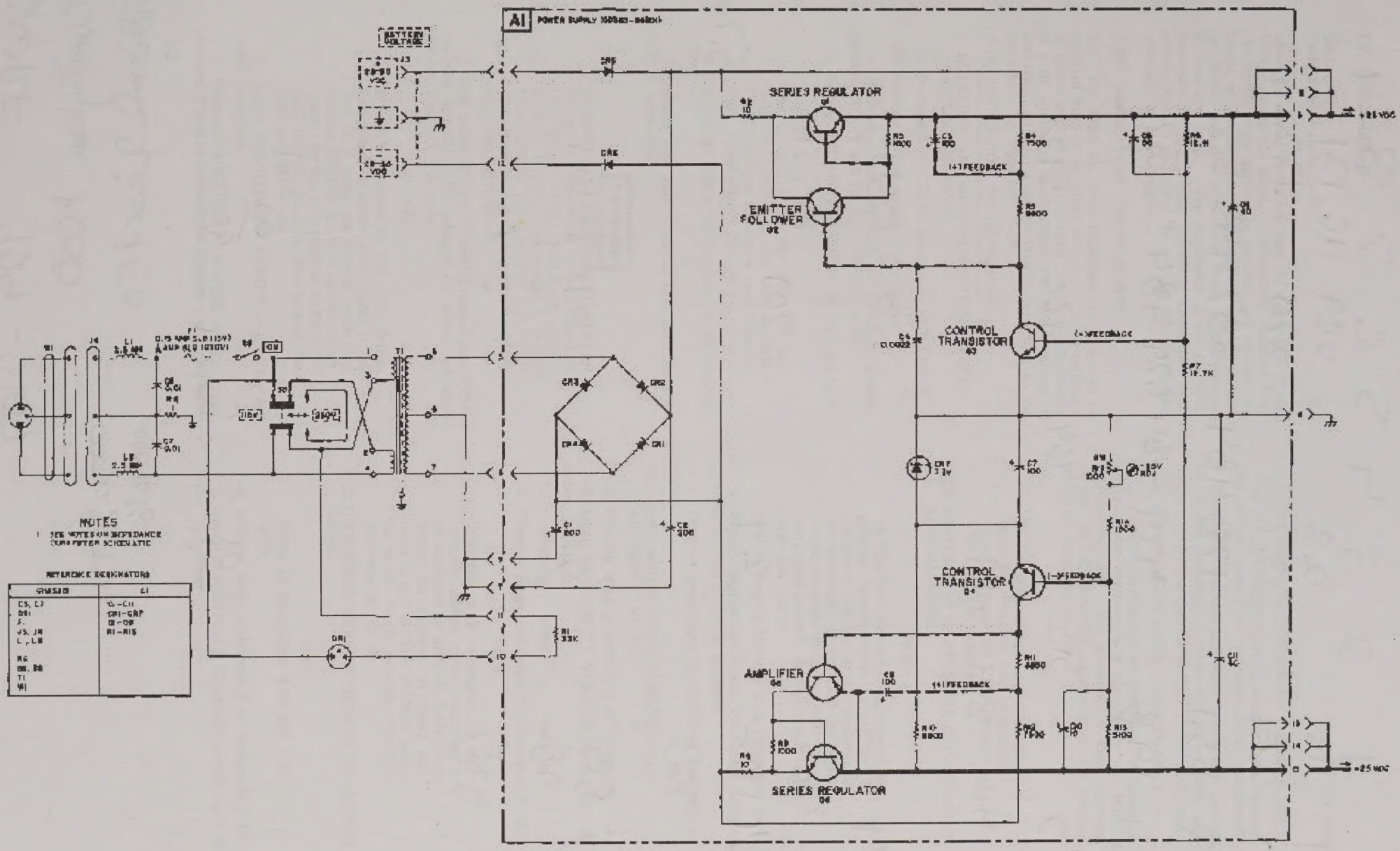

Figure 6-5. Power Supply

	1	2	3	4	5	6	7	8	9
V1	116		2.8			259	116	121	
V2	274		13.7			270		13.7	
V3	55.1		478	484		8.87	485	57	
V4	14.8		479	484		9.24	484	57	
V5		512		464		466		512	

414 391 418

22k V1 108 2.6 288 108 15

387

27k V1 102 2.4 301 102 110

363

5.7ma

519

33k 95 2.2 309 95 104

335

$$10^{\frac{-55}{10}} = 10\log x \quad \frac{10}{10}$$

WAGNER 929-3107

Tim Cameron $600

Slobbone Slicer $150

,000012%GTHD

,000 16%

about the device under test than the expression of distortion magnitude alone. Information obtained from the oscilloscope pattern is specific and reveals the nature of the distortion that sometimes occurs at such low levels that it is difficult to detect in the presence of hum and noise. The impedance at the OUTPUT terminals is 2000 ohms, therefore, capacitive loads greater than 50 pf should 'be avoided to maintain the accuracy of meter readings.

3-16. OPERATING PROCEDURES.

3-17. The 333A and 334A Distortion Analyzers can be operated from an ac power source (115/230 volt) or a dc power source (+28 to +50 and -28 to -50 volt source). If a dc source is used, check the -25 v output. If necessary, adjust the power supply according to the procedures in Paragraph 5-27.

3-18. DISTORTION MEASUREMENT.

3- 19. DISTORTION MEASUREMENT IN PERCENT, AUTOMATIC MODE.

a. Position FUNCTION selector to SET LEVEL.

b. Position MODE switch to MANUAL.

c. If fundamental frequency is 1 Kc or greater, position HIGH PASS FILTER SWITCH to IN.

d. Rotate SENSITIVITY selector to MIN position.

NOTE

The bandwith of the SENSITIVITY selector is reduced in the two extreme CCW positions (positions used with an input signal greater than 30 v).

e. Position METER RANGE selector to SET LEVEL 100%).

f. Connect test leads from device under test to INPUT terminals.

CAUTION

REMOVE SHORTING STRAP BETWEEN FLOATING GROUND ~ AND CHASSIS GROUND (+) TERMINALS ON FRONT PANEL INPUT TERMINALS WHEN MEASURING DISTORTION BETWEEN TWO POINTS WHICH ARE BOTH ABOVE GROUND POTENTIAL.

g. With SENSITIVITY VERNIER control max. CCW, position SENSITIVITY selector for meter indication greater than 1/3 full scale.

NOTE

If unable to adjust *for* full scale deflection which indicates input signal is below O. 3 volts, use manual mode and position METER RANGE selector downscale. Use this new position as the 100% SET LEVEL position, thus making the next *range 30%,* etc.

h. Adjust SENSITIVITY VENIER control for full scale deflection.

j. Position FRIQUENCY RANGE selector and frequency dial to fundamental frequency of input signal.

k. Position FUNCTION selector to DISTORTION,

m. Adjust METER RANGE selector and frequency dial vernier control for minimum meter indication.

n. Adjust COARSE and FINE BALANCE controls for further reduction of meter indication. Meter indication must be less than 10%of SET LEVEL indication.

p. Position MODE switch to AUTOMATIC.

r. Observe percentage of distortion indicated on meter. Meter indication is in conjunction with METER *RANGE* selector. For example, if meter indicates .4 and METER RANGE selector is on 1% position, distortion measured is 0.4%.

NOTE

RMS voltage of input signal being analyzed for distortion can be measured by positioning FUNCTION selector to VOLTMETER position.

3-20. DISTORTION MEASUREMENT IN PERCENT, MANUAL MODE.

NOTE

In MANUAL mode the accuracy of dis - tortion measurements is affected by frequency stability of the input signal. An inaccuracy in distortion indications occure when the frequency drift of the input signal exceeds the bandwidth of the rejection curve.

a. Perform steps a through n in Paragraph 3-19.

b. Repeat steps m and n until no further reduction in meter indication can be obtained.

c. Observe percentage of distortion indicated on meter.

3-21. DISTORTION MEASUREMENT IN DB, AUTOMATIC MODE .

a. Perform steps a through g of Paragraph 3-19.

b. Adjust SENSITIVITY VERNIER control for 0 db meter indication.

c. Perform steps j through 3-19.

d. Observe meter indication for distortion in db.

NOTE

Distortion in db is obtained by algebraically adding meter indication to db indicated by METER RANGE selector: for example, If meter indicates -2 and METER *RANGE* selector is on -20 db position, distortion measured is -22 db.

3-22. DISTORTION MEASUREMENT IN DB, MANUAL MODE .

NOTE

Notes in Paragraphs 3-20 and 3-21 apply.

a. Perform steps a through g of Paragraph 3-19.

b. Adjust SENSITIVITY VERNIER control for O db meter indication.

c. Perform steps j through n of Paragraph 3-19.

d. Repeat steps m and n until no further reduction n meter indication can be obtained.

e. Observe meter indication for distortion in db.

3-23. DISTORTION MEASUREMENT OF AM RF CARRIERS. (334A Only)

a. Set NORM - RF SET selector to RF SET.

CAUTION

OBSERVE MAXIMUM INPUT VOLTAGES AS INDICATED ON REAR PANEL.

b. Connect Input to RF INPUT on rear panel.

c. Adjust SENSITIVITY VERNIER control for O db meter indication.

d. Perform steps j through n of Paragraph 3-19.

e. Refer to Paragraph 3-20 for manual measurement in percent.

f. Refer to Paragraph 3-21 and 3-22 for automatic and manual measurement in db.

-24. VOLTMETER MODE.

NOTE

If DBM measurements are to be made, the DB markings on the METER RANGE switch must each be lowered by 10. That is, the DB marking for the O. 3 v range becomes -10 DBM, 1 v range becomes O DBM, 3 v range becomes +10 DBM etc. If the other DB markings are used, the DBM readings will be 10 DBM high.

3-25. The 333A and 334A perform as general purpose AC Voltmeters when the FUNCTION selector is set to VOLTMETER position.

NOTE

With the FUNCTION selector in VOLTMETER position, the SENSITIVITY selector is disabled.

a, Position METER RANGE selector to a range exceeding the value of the signal to be measured.

b. Connect signal to INPUT terminals.

c. Select a METER RANGE to give a reading as close to full scale as possible and observe meter indication.

3-26. OUTPUT TERMINALS.

3-27. In VOLTMETER or SET LEVEL position of the FUNCTION selector, the 333A/334A can be used as a low distortion, high gain, wideband preamplifier. A portion of the meter input (O. 1 v RMS output for full scale meter deflection) is provided at the OUTPUT terminal J2. In the DISTORTION position, the distortion is provided for monitoring purposes.

CAUTION

DO NOT EXCEED THE VOLTAGES LISTED BELOW TO PREVENT BLOWING FUSE F2:

VOLTMETER.= -1 V RANGE AND BELOW, AND DISTORTION ANALYZER, MODE-MAXIMUM SENSITIVITY.
1. 300 V ABOVE 100 CPS
2. 50 V ABOVE 1 KC

IF LOW FREQUENCIES ARE NOT TO BE MEASURED, Cl MAY BE REPLACED WITH A SMALLER CAPACITOR, AND THE VOLTAGE LIMITS OF F2 MAY BE RAISED ACCORDINGLY.

formation about the device under test than the expression of distortion magnitude alone. Information obtained from the oscilloscope pattern is specific and reveals the nature of distortion which sometimes occurs at such low levels that it is difficult to detect in the presence of hum and noise. The impedance at the OUTPUT terminals is 2000 ohms, therefore, capacitive loads greater than 50 pF should be avoided to maintain the accuracy of meter readings.

3-14. OPERATING PROCEDURES.

3-15. INSTRUMENT TURN-ON.

a. Set the 115-230 VAC switch to coincide with the line voltage in use. Turn switch to ON position. Pilot lamp will glow, indicating application of primary power.

3-16. ADJUSTMENT OF METER MECHANICAL ZERO.

3-17. The meter is properly zero-set when the pointer rests over the zero calibration mark and the instrument is in its normal operating enivronment and is turned off. Zero-set the meter as follows to obtain maximum accuracy and mechanical stability:

a. Turn instrument on and allow it to operate for at least 20 minutes, to let meter movement reach normal operating temperature.

b. Turn instrument off and allow 30 seconds for all capacitors to discharge.

c. Rotate zero adjustment screw clockwise until pointer is left of zero and moving upscale.

d. Continue rotating screw clockwise; stop when pointer is exactly at zero.

e. When pointer is exactly over zero, rotate adjustment screw slightly counterclockwise to relieve tension on pointer suspension. If pointer moves off zero, repeat steps c through e, but make counterclockwise rotation less.

3-18. DISTORTION MEASUREMENT.

CAUTION

DO NOT EXCEED THE INPUT VOLTAGES LISTED BELOW TO PREVENT DAMAGING COMPONENTS ON A2 BOARD.

VOLTMETER FUNCTION -1V RANGE AND BELOW, AND DISTORTION ANALYZER FUNCTION - MAXIMUM SENSITIVITY.
1. 300 V ABOVE 100 Hz
2. 50 V ABOVE 1 kHz

3-19. MANUAL MODE.

a. Turn instrument on and mechanically zero meter according to procedure in Paragraphs 3-15 and 3-16.

b. Set NORM-R. F. DET. switch to NORM.

c. Set FUNCTION switch to SET LEVEL.

d. Set MODE switch to MANUAL.

e. If fundamental frequency is 1 kHz or greater, set HIGH PASS FILTER switch to IN.

f. Set SENSITIVITY selector to MIN. position, and rotate VERNIER control maximum counterclockwise.

NOTE

The bandwidth of the SENSITIVITY selector is reduced in the two extreme CCW positions (positions used with an input signal greater than 30 V).

g. Set METER RANGE switch to SET LEVEL, and set BALANCE COARSE and FINE controls to center position.

h. Connect signal to be measured to 333A/334A INPUT terminals.

WARNING

REMOVE SHORTING STRAP BETWEEN FRAME GROUND (⊥) AND CHASSIS GROUND (⏚) TERMINALS ON FRONT PANEL INPUT TERMINALS WHEN MEASURING DISTORTION BETWEEN TWO POINTS WHICH ARE DC OFFSET FROM GROUND POTENTIAL.

i. Set SENSITIVITY selector to obtain meter indication greater than 1/3 full scale.

j. Adjust SENSITIVITY VERNIER for full scale meter indication if making distortion measurement in percent; if making distortion measurement in dB adjust SENSITIVITY VERNIER for 0 dB meter indication.

NOTE

If unable to adjust for full scale or 0dB indication, (which indicates input signal is below 0.3 volts), set METER RANGE selector downscale. Use this new setting as the 100% or 0dB SET LEVEL position, thus making the next range 30% or -10 dB, etc.

k. Set FREQUENCY RANGE switch and frequency dial to fundamental frequency of input signal.

l. Set FUNCTION switch to DISTORTION.

m. Adjust frequency dial vernier and BALANCE COARSE and FINE controls for minimum

meter indication. Set METER RANGE switch down-scale as necessary to keep meter indication on scale.

n. Repeat step m until no further reduction in meter indication can be obtained.

o. Observe distortion either in percentage or dB, as indicated by meter deflection and METER RANGE switch setting. For example, if meter indicates 0.4 and METER RANGE setting is 1%, distortion measured is 0.4% of fundamental. Similarly, if meter indicates -6 dB and METER RANGE setting is -40 dB, distortion measured is -46 dB from fundamental.

NOTE

In MANUAL mode the accuracy of distortion measurements is affected by frequency stability of the input signal. An inaccuracy in distortion indications occurs when the frequency drift of the input signal exceeds the bandwidth of the rejection curve.

p. If desired, rms voltage of input signal can be measured by setting FUNCTION switch to VOLTMETER, and setting METER RANGE switch to obtain an on-scale indication.

3-20. AUTOMATIC MODE.

a. Perform steps a through l of Paragraph 3-19.

b. Adjust frequency dial vernier and BALANCE COARSE and FINE controls for minimum meter indication.

c. When meter indication is less than 10% of SET LEVEL indication, set MODE switch to AUTOMATIC. (If fundamental cannot be manually nulled below 10% of SET LEVEL indication, automatic mode cannot be used).

d. Set METER RANGE switch down-scale to obtain on-scale meter indication.

e. Observe distortion either in percentage or dB, as indicated by meter deflection and METER RANGE switch setting. For example, if meter indicates 0.4 and METER RANGE setting is 1%, distortion measured is 0.4% of fundamental. Similarly, if meter indicates -6 dB and METER RANGE setting is -40 dB, distortion measured is -46 dB from fundamental.

f. If desired, rms voltage of input signal can be measured by setting FUNCTION switch to VOLTMETER, and setting METER RANGE switch to obtain an on-scale indication.

3-21. DISTORTION MEASUREMENT OF AM RF CARRIERS (334A only).

CAUTION

DO NOT EXCEED MAXIMUM INPUT VOLTAGES LISTED ON REAR PANEL.

a. Turn instrument on and mechanically zero meter according to procedure in Paragraphs 3-15 and 3-16.

b. Set NORM.-R. F. DET. switch to R. F. DET.

c. Connect input signal to R. F. INPUT terminal on rear panel.

d. Refer to Paragraph 3-19 for manual distortion measurement; refer to Paragraph 3-20 for automatic distortion measurement.

NOTE

If no meter deflection can be obtained with an RF input, diode A4CR1 should be checked. A spare diode is located on the outside of the A4 shield.

3-22. VOLTAGE MEASUREMENT.

a. Turn instrument on and mechanically zero meter according to procedure in Paragraphs 3-15 and 3-16.

b. Set NORM.-R. F. DET. switch to NORM.

c. Set FUNCTION switch to VOLTMETER.

d. Set METER RANGE switch to a range exceeding amplitude of signal to be measured.

e. Connect signal to be measured to INPUT terminals.

f. Set METER RANGE switch to give a reading as close to full scale as possible, and observe meter indication.

g. The dB scale of the 333A/334A is calibrated in dBm, such that 0 dBm = 1 milliwatt dissipated by 600 ohms. Therefore, a dBm measurement must be made across 600 ohms. However, dB measurements across other impedances can be converted to dBm by use of the Impedance Correction Graph of Figure 3-3. For example: to convert a -30 dB reading across 200 ohms to dBm, locate the 200 ohm impedance line at the bottom of the graph. Follow the impedance line to the heavy black line, and read the meter correction at that point. The correction for 200 ohms is +5 dBm; thus the corrected reading is -25 dBm.

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Table 5-1. Calibration Chart (Continued)

Step	Check	Tester	Cal Points	Control Settings	Adjust	Desired Results	Remarks
5	Distortion	Distortion analyzer (50Ω terminated	50Ω OUT	Function ∿	R72 R93	Minimum distortion	
6	VCG null	Scope		FREQ MULT: X 100K Function: ⊓ Dial: full cw Scope vert: 2V/div Scope horiz: .5 ms/div	R40	Minimum frequency shift	Adjust generator dial to display one cycle on scope. Alternately short and open VCG IN BNC while adjusting R40.
7	Horizontal symmetry			Scope Horiz: X 10 on	R42	Maximum symmetry	Alternately switch scope triggering from positive to negative slope while adjusting R42.
8				Dial: 01 FREQ MULT: X 10 Scope sweep: 0.1s/div, dc triggering	R60		
9	Frequency accuracy	Counter		Dial: 2.0 FREQ MULT: X 1 thru X 10K	R32	Best frequency accuracy over X 1 thru X 10K	
10				FREQ MULT: X 1M Function: ⊓ Dial: 2.0	C37	2.020 MHz	
11				Function: ⊓, ∿, ∿		Best frequency tracking on X 1M range	
12	Internal reference		REF OUT	Mode toggle switch: towards digital switch	C1	1 MHz ±20 Hz	C1 is on synthesizer board.
13	F/V balance	Scope or DVM	TP5 (TP1 common)	FREQ MULT: X 10K Digital Switch: 0.1000	R31	0 ±0.1 Vdc	
14	F/V gain			Digital Switch: 0.9999	R28	+1 Vdc approx	
15				Digital Switch: 1.9999		−1 Vdc approx	If necessary, reset R28 for best balance between 0.9999 and 1.9999.
16	Frequency range	Counter	50Ω OUT	FREQ MULT: X 1M thru X 10 Function: ⊓		Reading ±0.005% each setting	

SECTION 5
CALIBRATION

5.1 FACTORY REPAIR

Wavetek maintains a factory repair department for those customers not possessing the necessary personnel or test equipment to maintain the instrument. If an instrument is returned to the factory for calibration or repair, a detailed description of the specific problem should be attached to minimize turnaround time.

5.2 REQUIRED TEST EQUIPMENT

DVM (3½ digit)

Distortion Analyzer (1% F.S.) HP334A

Oscilloscope (≥ 40 MHz bandwidth, X 10 horizontal magnification, dc triggering to 1 Hz)

BNC Termination (50Ω ≤ 1%, ≥ 1W)

Frequency Counter (6 digits, time base accuracy ≥ 50 ppm)

Low Frequency Spectrum Analyzer HP3580A

5.3 REMOVING GENERATOR COVER

For main board access, remove the four screws in the lower cover, place the instrument on its feet and lift off the top cover. For later access to the synthesizer board, remove the four screws from the inside corners of the lower board that attach it via standoffs to the lower cover. Do not remove the lower cover unless necessary, because it supports front and rear panels.

5.4 CALIBRATION

After referring to the following preliminary data, perform calibration, as necessary, per table 5-1. If performing partial calibration, check previous settings and adjustments for applicability.

1. Unless otherwise noted, all measurements made at the 50Ω OUT connector should be terminated into a 50Ω (≤ 1%, 1W) load.

2. Before connecting the unit to an ac source, check the ac line circuit to make sure the 115/230 volt switch is set at the correct position (see paragraph 2.2).

3. Start the calibration by setting the front panel switches as follows:

Dial 2.0
FREQ MULT ..... X 1K
Mode (toggle switch) ..... Toward Dial
Digital Switch 0.1000
DC OFFSET ..... OFF
Function ..... DC
AMPLITUDE ..... ccw
ATTENUATION 0

4. Allow the unit to warm up at least 30 minutes for final calibration. Start the calibration on main board. All test points are located on the main board.

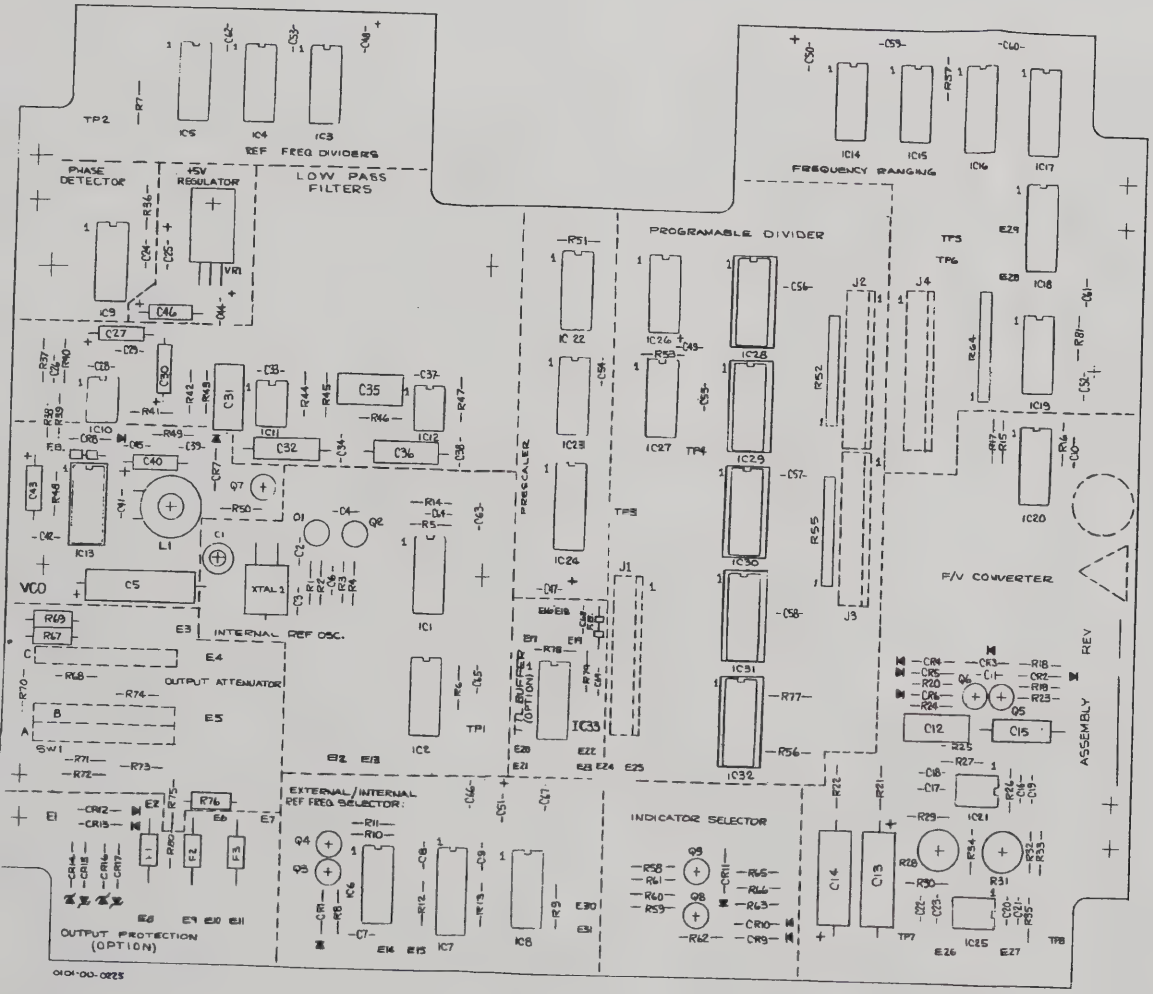
Table 5-1. Calibration Chart

Step	Check	Tester	Cal Points	Control Settings	Adjust	Desired Results	Remarks
1	Power supply regulation	DVM	TP2 (TP1 ground)		R20	+15 ±0.01V	Main board
2			TP3 (−15V)			−15 ±0.05V	
3	Output dc balance	Scope or DVM	50Ω OUT		R116	0 ±0.01 Vdc	
4				AMPLITUDE: cw	R141		

Table 5-1. Calibration Chart (Continued)

Step	Check	Tester	Cal Points	Control Settings	Adjust	Desired Results	Remarks
17	Frequency bits	Counter	50Ω OUT	FREQ MULT: X 10K Digital Switch: 0.1111 thru 0.9999		Proper reading on counter	
18	Spectral purity	Spectrum Analyzer		Function: ∿ Digital Switch: 1.9999		Spurious signals below −70 dB. Noise floor below −60 dB.	Set 3580A controls for a 3 Hz bandwidth with minmum smoothing; scanning 20 Hz/div at 5s/div. Check that average of noise floor at f_0 + 3 Hz is below −60 dBc and that no line related spurs are above −70 dBc. **Keep power lines away from analyzer input.**

REV	ECN	BY	DATE	APP
E	ECN 1809	JRM	9-9-8	
F	ECN 2467	LDD	11-9-8	



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0101-00-0225 F
SYNTHESIZER BD.
4.33.5
4-30-76
1 of 2

c. Set test oscillator frequency to 500 Hz, and adjust amplitude for indication of +2 dB on 333A/334A meter.

d. Set 333A/334A FUNCTION switch to DISTORTION.

e. Adjust 333A/334A frequency dial vernier and BALANCE controls for minimum meter indication. When meter indication is less than 10% of SET LEVEL indication, set MODE switch to AUTOMATIC.

f. Reduce 333A/334A METER RANGE setting as necessary to maintain on-scale meter indication.

g. 333A/334A meter indication should be at least 70 dB below +2 dB reference.

h. Repeat steps b through g with 333A/334A and test equipment frequencies set to 250 kHz and 600 kHz. 333A/334A meter indication should be at least 64 dB below +2 dB reference.

5-13. FREQUENCY CALIBRATION ACCURACY CHECK.

a. Connect test equipment to 333A/334A as shown in Figure 5-4. Set electronic counter to read period.

NOTE

In this check, the 333A/334A frequency dial is held constant and the input frequency is varied and monitored. If the dial is low, the input frequency will be high at null and vice versa.

b. Set 333A/334A controls as follows:

FUNCTION	SET LEVEL
SENSITIVITY	MAX.
METER RANGE	0DB
MODE	MANUAL
FREQUENCY RANGE	X1
Frequency Dial	10

c. Set test oscillator frequency to 10 Hz, and adjust amplitude for indication of +2 dB on 333A/334A meter.

d. Set 333A/334A FUNCTION switch to DISTORTION.

e. Do not adjust 333A/334A frequency controls. Adjust test oscillator frequency and 333A/334A BALANCE controls for minimum indication on 333A/334A meter.

f. Repeat step e until best null is indicated on 333A/334A. Reduce METER RANGE setting as necessary to maintain on-scale meter indication.

g. Electronic counter should indicate period of 100 msec ± 5 msec (10 Hz ± 5%).

h. Set electronic counter to read frequency. Repeat Steps b through f for each frequency listed in Table 5-4. At each respective frequency setting, electonic counter should indicate that test oscillator frequency is within tolerances listed in table.

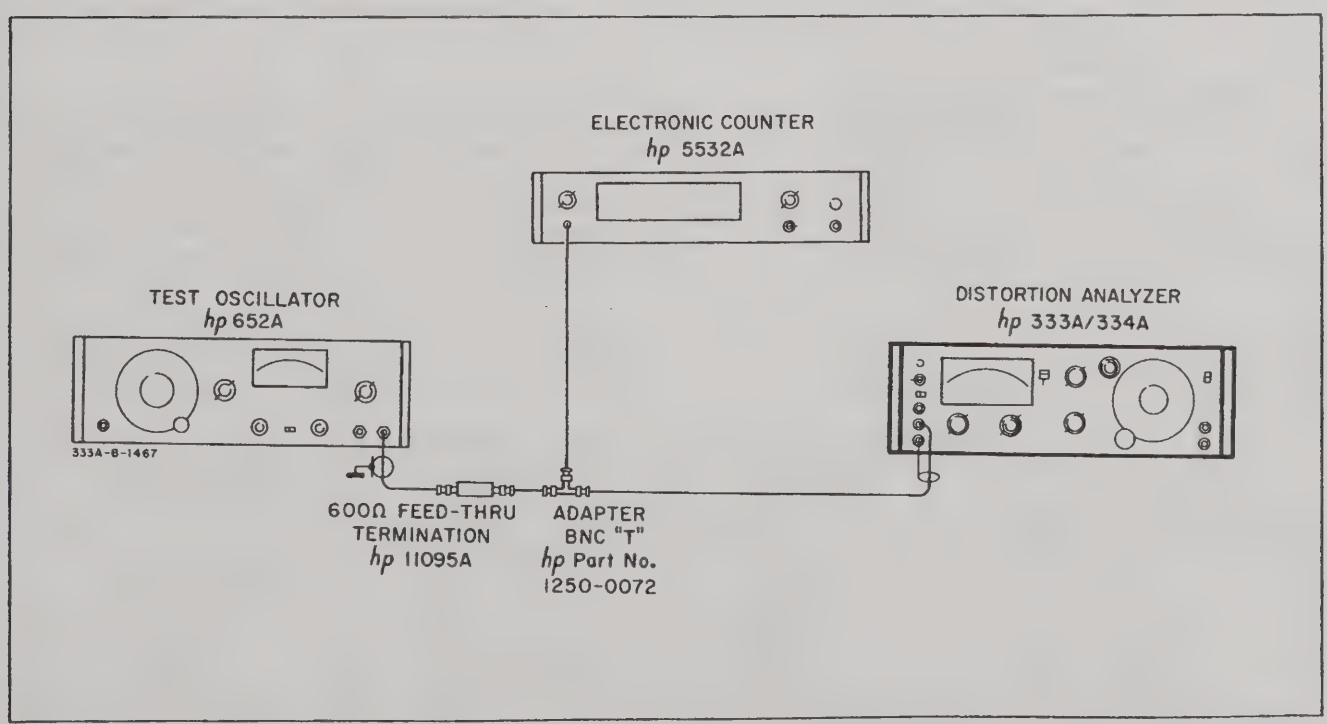
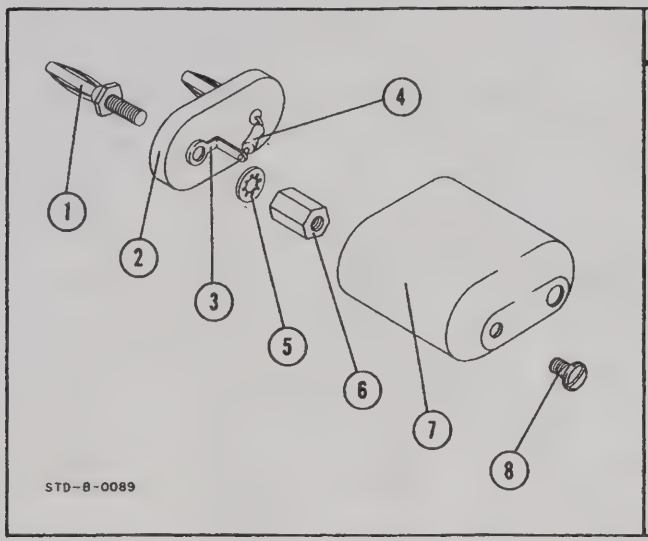


Figure 5-4. Frequency Calibration Accuracy Check



No.	Description	-hp- Part No.
1	Connector, male	1251-0174
2	Connector, male w/insulator	1251-0175
3	Lug, terminal 90°	0360-0042
4	Resistor, 100 kΩ, 1/2 W, 5%, metal film	0758-0053
	OR	
4	Resistor, 600 Ω, 1/4 W, 0.5%, metal film	0757-1037
5	Washer, int. lock	2190-0007
6	Spacer, 6-32 threaded	0380-0058
7	Shield	1251-1073
8	Screw, bind. head, 6-32 x 1/4 in.	2470-0001

Figure 5-7. Shielded Load Assembly

c. Set high frequency signal generator to 1 MHz at an amplitude of 3 V. Modulate high frequency signal generator output 30% at 1 kHz, using a test oscillator.

d. Adjust 334A SENSITIVITY controls for 0dB meter indication.

e. Set 334A FUNCTION switch to DISTORTION.

f. Adjust 334A frequency dial vernier and balance controls for minimum meter indication.

g. Distortion should be more than 40 dB below 0dB reference.

5-23. ADJUSTMENT AND CALIBRATION PROCEDURE.

5-24. The following is a complete adjustment and calibration procedure for the 333A and 334A. Before proceeding with these adjustments, the Performance Checks should be performed to determine whether adjustments are necessary. If your instrument does not meet the test limits specified in the following steps, refer to Troubleshooting Procedure, Paragraph 5-34. Adjustment locations are shown in Figure 5-8.

5-25. The adjustment and Calibration Procedure is performed with the ac power cord connected to nominal line voltage (115 V/230 V) 48 to 66 Hz, MODE switch to MANUAL, HIGH PASS FILTER TO OUT, and NORM.-R. F. DET. switch to NORM, unless otherwise specified.

5-26. POWER SUPPLY AND BIAS ADJUSTMENTS.

a. Remove top and bottom covers.

b. Secure shorting bar between chassis ground and circuit ground INPUT terminals.

c. Connect common lead of a dc voltmeter to either INPUT ground terminal.

d. Perform the measurements and adjustments listed in Table 5-5.

CAUTION

DO NOT ALLOW PROBE TO SHORT A2TP1 TO GROUND. IF THIS HAPPENS, A2Q4 MAY BE DESTROYED.

5-27. VOLTMETER GAIN ADJUSTMENTS.

a. Connect voltmeter calibrator to 333A/334A as shown in Figure 5-1.

b. Set Distortion Analyzer controls as follows:

FUNCTION . . . . . VOLTMETER
METER RANGE . . . . . 0.001 VOLTS

Table 5-5. Power Supply and Bias Adjustments

MEASUREMENT POINT	VOLTAGE LIMITS	ADJUSTMENT	REGULATION (vary line voltage between 103.5 and 126.5 VAC)
Any violet wire	-25 V ± 0.5 V	A1R13	-25 V ± 0.25 V
Any red wire	+25 V ± 1.0 V	None*	+25 V ± 1.0 V
A2 TP1	-11.3 V	A2R3	-11.3 V ±0.1 V
A2 TP2	+8.2 V ± 0.5 V	A2R20	+8.2 V ± 0.5 V
A3 TP1	+2.65 V ± 0.2 V	A3R4	+2.65 V ± 0.2 V
A3 TP2	-19.5 V ± 0.5 V	A3R16	-19.5 V ± 0.5 V

*Referenced to -25 volt supply; -25 volt supply must be adjusted first.

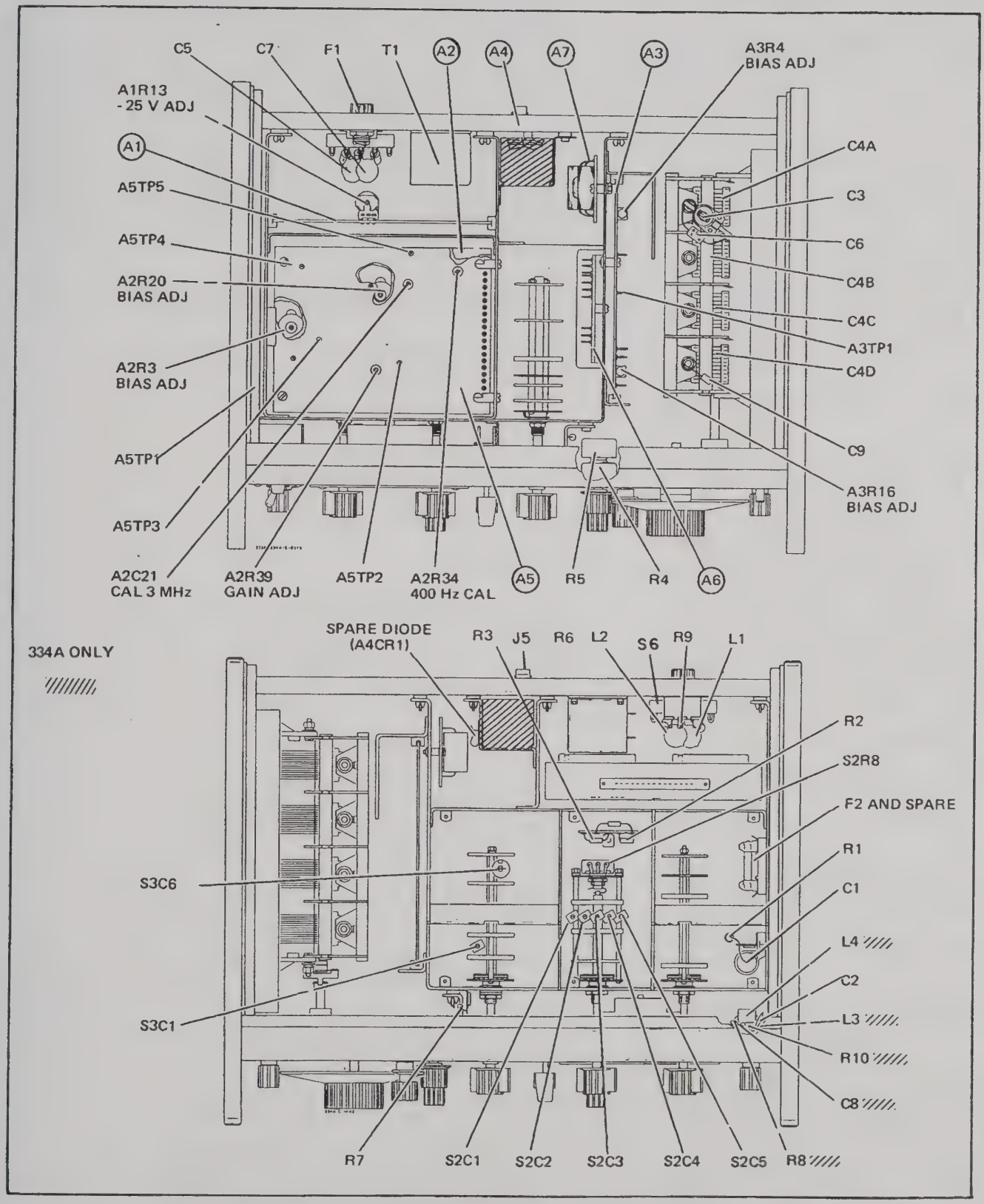


Figure 5-8. Adjustment and Chassis Mounted Component Location.

c. Set voltmeter calibrator to 1 mV rms output at 400 Hz.

d. Adjust A2R34 (400 Hz CAL.) for a meter indication of 1.0 mV.

e. Set Voltmeter Calibrator to 0.3 mV rms output. Set 333A/334A METER RANGE switch to 0.0003 VOLTS.

f. The meter should indicate 300 μV ± 6 μV (±2%). If necessary, change value of A2R30* to set reading within these limits. Typical values for this resistor are from 150Ω to 300Ω. Increasing resistance decreases the meter reading, and vice versa.

5-28. VOLTMETER FREQUENCY RESPONSE ADJUSTMENT.

a. Connect test oscillator to 333A/334A as shown in Figure 5-1.

NOTE

Cover plate (Item 33 in Figure 6-1) must be in place before performing these adjustments.

b. Set 333A/334A controls as follows:

FUNCTION . . . . . VOLTMETER
METER RANGE . . . . . 0.0003 VOLTS

c. Set test oscillator to 400 Hz, and adjust amplitude for 333A/334A meter indication of 300 μV. Set a reference on meter of test oscillator and use amplitude control to maintain set reference whenever frequency of oscillator is varied.

d. Set test oscillator frequency to 20 Hz.

e. 333A/334A meter should indicate 300 μV ± 15 μV. If reading exceeds these limits, change value of A2C30*. Typical values for this capacitor are between 10 μF and 50 μF.

f. Set 333A/334A METER RANGE switch to 1 VOLT.

g. Disconnect test oscillator, and connect voltmeter calibrator to 333A/334A as shown in Figure 5-6.

h. Set voltmeter calibrator to 0.9 V rms at 400 Hz. Note 333A/334A meter reading.

i. Disconnect voltmeter calibrator and connect test oscillator to 333A/334A.

j. Set test oscillator frequency to 400 Hz, and adjust amplitude so that 333A/334A meter reading is same as in step h. Set a reference on meter of test oscillator and use amplitude control to maintain set reference whenever frequency of oscillator is varied.

k. Set test oscillator frequency to 2 MHz, and attenuate output by 40 dB, maintaining reference set in step j.

l. Set 333A/334A METER RANGE switch to 0.01 VOLTS.

m. Adjust A2R39 for 333A/334A meter indication of 9 mV.

n. Set test oscillator frequency to 3 MHz.

o. Adjust A2C21 for 333A/334A meter indication. of 9 mV.

NOTE

Adjustments of A2R39 and A2C21 interact. Therefore, it may be necessary to repeat the two adjustments to bring both within tolerance.

p. Set 333A/334A METER RANGE switch to .3 VOLTS.

q. Disconnect test oscillator, and connect voltmeter calibrator to 333A/334A.

r. Set voltmeter calibrator to 0.3V rms at 400 Hz. Note 333A/334A meter reading.

s. Disconnect voltmeter calibrator, and connect test oscillator to 333A/334A.

t. Set test oscillator frequency to 400 Hz, and adjust amplitude until 333A/334A meter indication is same as in step r. Set a reference on meter of test oscillator and use amplitude control to maintain set reference whenever frequency of oscillator is varied.

u. Set test oscillator frequency to 2.5 MHz.

v. Adjust S3C6 for 333A/334A meter indication of 0.3 V.

w. Set 333A/334A METER RANGE switch to 3 VOLTS.

x. Set test oscillator frequency to 200 kHz, and increase amplitude by 20 dB, maintaining reference set in step t.

y. Adjust S3C1 for 333A/334A meter indication of 3 V.

5-29. BRIDGE BALANCE ADJUSTMENT.

CAUTION

MAINTAIN THE LEAD DRESS TO C3 AND THE TUNING CAPACITOR, C4. ANY CHANGE IN LEAD DRESS WILL CAUSE A CHANGE IN CAPACITANCE.

a. Connect test equipment to 333A/334A as shown in Figure 5-4.

b. Set 333A/334A controls as follows:

FUNCTION . . . . . SET LEVEL

SENSITIVITY VERNIER . . . . . MIN.
SENSITIVITY. . . .1 step counterclockwise
METER RANGE . . . . . SET LEVEL
MODE. . . . . MANUAL
FREQUENCY RANGE X1K
Frequency Dial. 60

c. Turn slot on trimmer capacitor C3 parallel with side casting of instrument.

d. Set test oscillator frequency to 60 kHz, and adjust amplitude for indication of +2 dB on 333A/334A meter.

e. Set 333A/334A COARSE and FINE BALANCE controls to center of range.

f. Set 333A/334A FUNCTION switch to DISTORTION.

g. Adjust test oscillator frequency vernier control and C3 for definite null indication on meter of 333A/334A. Reduce METER RANGE setting as necessary to maintain on-scale reading.

h. Observe electronic counter indication. If test oscillator frequency is not between 57 kHz and 63 kHz, 333A/334A frequency dial is out of tolerance. Follow steps below to bring frequency dial within tolerance:

1) Set 333A/334A controls as in step b. Set test oscillator frequency for electronic counter indication of 60.00 kHz, and adjust amplitude for indication of +2 dB on meter of 333A/334A.

2) Set 333A/334A COARSE and FINE BALANCE controls to center of range.

3) Adjust 333A/334A frequency dial vernier control for definite null.

4) Remove knob from frequency dial. Do not change tuning capacitor, C4, setting

5) Loosen retaining screws in frequency dial plate, and slip dial until 60 is directly under mark on indicator. Be careful not to change C4 setting.

6) Tighten retaining screws and replace knob.

5-30. SENSITIVITY SWITCH CALIBRATION.

a. Connect test oscillator to 333A/334A as shown in Figure 5-1.

NOTE

Selector positions for the SENSITIVITY selector will be referred to as follows: MIN = Position 1, next step = Position 2, etc., to MAX = Position 6.

b. Set Distortion Analyzer controls as follows:

FUNCTION . . . . . SET LEVEL
METER RANGE . . . . . 0.01 VOLTS
SENSITIVITY . . . . . Position 5
SENSITIVITY VERNIER . . . . . MAX.

c. Set test oscillator frequency to 400 Hz, adjust amplitude for indication of 9 mV on 333A/334A meter.

d. Set a reference on meter of test oscillator and use amplitude control to maintain set reference whenever frequency of oscillator is varied.

e. Set test oscillator frequency to 100 kHz.

f. Adjust S2C5 for 333A/334A meter indication of 9 mV.

g. Set 333A/334A SENSITIVITY switch to each position listed in Table 5-6, and increase test oscillator output by 10 dB for each respective decrease in SENSITIVITY switch position. Adjust appropriate capacitor for 333A/334A meter indication of 9 mV at each setting.

NOTE

When switching the SENSITIVITY positions, be careful not to move SENSITIVITY VERNIER control from MAX. position.

5-31. ADJUSTMENT OF FACTORY SELECTED COMPONENTS.

5-32. Certain components in the Model 333A/334A are individually selected to compensate for varying circuit parameters. These components are designated by an asterisk (*) on the schematic and in the parts list, and the typical value is shown. Table 5-7 describes the function of the factory selected components and lists their value ranges.

5-33. TROUBLESHOOTING PROCEDURES.

5-34. This section contains procedures designed to assist in the isolation of malfunctions. These procedures are based on a systematic analysis of the instrument circuits in an effort to localize the prob-

Table 5-6. Sensitivity Switch Calibration

SENSITIVITY Switch	TEST OSCILLATOR OUTPUT (Increase)	ADJUST FOR 9 mV
Position 4	+10 dB	S2C4
Position 3	+20 dB	S2C3
Position 2	+30 dB	S2C2
Position 1	+40 dB	S2C1